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SARS COV-2 Infection in an Allergic Asthma Patient Taking Omalizumab: A Case Report

Omalizumab Kullanan Alerjik Astım Hastasında SARS COV-2 Enfeksiyonu: Olgu Sunumu

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Abstract

In March 2020, the World Health Organization declared a pandemic due to the coronavirus disease (COVID-19) caused by the SARS-CoV-2 virus affecting the respiratory tract. Comorbid diseases with severe lung involvement were defined for this infection. Due to its multifactorial pathophysiology, asthma has become one of the most curious, researched, and controversial diseases with comorbidity. The relationship between viral load and disease symptoms of biological agents, which are becoming more important and increasingly used in treating chronic diseases, is being investigated. Omalizumab is a human anti-immunoglobulin E (IgE) antibody approved for asthma and chronic urticaria use. We present the course of COVID-19 disease in a 20-year-old patient with allergic asthma whose asthma symptoms were under control with omalizumab for one year. Our patient had an outpatient course for COVID-19 without developing a cough or other asthma attack symptoms and without hospitalization. By presenting this case, we would like to emphasize that omalizumab treatment during COVID-19 disease does not affect the course of the disease.

Keywords Asthma, COVID-19, omalizumab

Özet

Dünya Sağlık Örgütü tarafından 2020 yılı Mart ayında, solunum yolunu etkileyen SARS-CoV-2 virüsünün sebep olduğu koronavirüs hastalığı (COVID-19) nedeniyle pandemi ilan edildi. Ağır akciğer tutulumuyla seyreden bu enfeksiyon için komorbid hastalıklar tanımlandı. Çok faktörlü patofizyolojisi nedeniyle astım, en çok merak edilen, araştırılan ve komorbiditesi tartışmalı hastalıklardan birisi oldu. Gün geçtikçe kronik hastalıkların tedavisinde yeri önem kazanan ve kullanımı artan biyolojik ajanların, viral yükle ve hastalık semptomlarıyla ilişkisi ise araştırılmaktadır. Omalizumab astım ve kronik ürtikerde kullanım onayı olan insan kaynaklı anti immunglonulin E (IgE) antikorudur. Yirmi yaşında alerjik astım tanılı, bir yıldır omalizumab ile astım semptomları kontrol altında seyreden hastamızın COVID-19 hastalığı seyrini sunuyoruz. Hastamız öksürük veya diğer astım atak semptomları geliştirmeden, hastaneye yatırılmadan, COVID-19 hastalığını ayaktan geçirdi. Bu olgumuzu sunarak, COVID-19 hastalığı sırasında omalizumab tedavisinin hastalığın seyri üzerine etkisi olmadığını belirtmek istiyoruz.

Anahtar Kelimeler *Astım, COVID-19, omalizumab*

INTRODUCTION

The World Health Organization declared a pandemic of novel coronavirus (SARS-CoV-2) infection in March 2020. Some comorbid conditions, such as hypertension, diabetes, and coronary artery disease, are known to carry a high risk for SARS-CoV-2 infection with severe symptoms. For asthma, this is controversial. Although it is generally known that asthma patients under control with medication do not experience severe SARS-CoV-2 infection, asthma phenotyping was not performed in these studies in the literature. In addition to the hypothesis that eosinophilic asthma would be protective for COVID-19 infection, there is also a hypothesis that assumes that if the virus manages to cause clinical symptoms in patients with allergic asthma, the risk of disease progression is higher compared to COVID-19 patients with non-allergic asthma.[1,2] With our case report, we wanted to contribute to the literature by sharing the clinical course of our patient with SARS-CoV-2 infection whose allergic asthma was under control with omalizumab.

CASE PRESENTATION

A 20-year-old female patient had allergic rhinitis symptoms in childhood and was diagnosed with allergic asthma with the addition of respiratory symptoms over time. Dermatophagoides pteronyssinus spIgE:45.4 IU/ml, Dermatophagoides farinae spIgE:15.6 IU/ml in blood tests and D. farinae 15x11 mm, D. pteronyssinus 4x7 mm (positive control 5x5 mm, negative control 0x0 mm) in skin prick test. The patient started subcutaneous allergen immunotherapy for mite allergy at the age of 15. The patient, who had continued immunotherapy for about three years and received clinical benefits from immunotherapy during this period, interrupted immunotherapy eight months after the pandemic was declared. After this break and lack of follow-up, the frequency of asthma attacks increased. Asthma control was not good despite the use of inhaled corticosteroid and long-acting beta-agonist combination medication and concomitant montelukast. The total IgE level was 711 IU/ml, and omalizumab (600 mg once every four weeks) was started. After the second month of omalizumab treatment, asthma was under control, and there was no need for a short-acting beta agonist in the follow-up. In the 12th month of omalizumab treatment, the patient presented to the emergency department with back pain, weakness, fatigue, and itching sensation in the throat. COVID-19 PCR test was found positive in the tests performed. In laboratory tests, white blood cell count was 7.24 K/uL, neutrophil count was 3.30 K/uL, lymphocyte count was 2.97 K/uL, eosinophil count was 0.55 K/uL, C-reactive protein was 0.5 mg/dl, routine biochemistry and liver function tests were within normal range. The patient had fatigue, malaise, headache, fever, and cough for six days. He did not use any medication other than regular paracetamol for the first three days and managed to overcome the disease as an outpatient.

The patient, whose asthma was controlled with omalizumab, received two doses of inactivated COVID-19 vaccine (Sinovac®) three months before the illness, one month apart, and survived the COVID-19 infection without developing severe symptoms.

Consent was obtained from the patient for sharing clinical and laboratory information.

DISCUSSION

Asthma is characterized by shortness of breath, cough, wheezing, and tightness in the chest. The frequency and intensity of these symptoms may vary over time in the same patient. The disease is associated with chronic airway inflammation and airway hyperreactivity. Many cells and mediators are involved in this process. Irritant/allergen exposure, viral respiratory infections, and exercise can trigger symptoms. Symptoms may improve with treatment or may improve spontaneously depending on the severity of the symptoms.[3] It is widely accepted that viral infections in asthma may be associated with asthma attacks.[4]

Asthma is endotypically classified under four different

headings, including eosinophilic asthma (type2 helper T lymphocytes, Th2 dominant), neutrophilic asthma (type17 helper T lymphocytes, Th17 dominant), mixed inflammation (Th2 and Th17 together), and pausigranulocytic asthma (without an increase in polymorphonuclear cells in the lungs).[5] Asthma patients regulate the levels of various molecules, including angiotensin-converting enzyme 2 (ACE2), through various cytokines during respiratory viral infections. In this regulation, the endotype of the patient is important because of the cytokines formed. Interleukin-17 (IL-17) increases ACE2 expression, while IL-4 and IL-13 produced by Th2 decrease ACE2 expression.[6,7] Since the COVID-19 virus can only enter ACE2-expressing cells, the ACE2 receptor is crucial for developing and progressing COVID-19 infection.[8]

In the literature, Alberca et al. hypothesized that type 2 cytokines produced in eosinophilic asthma would decrease ACE2 expression and inactivate type 1 cytokines released in COVID-19, and therefore, allergic asthma would be a protective factor against severe COVID-19.1 On the other hand, Skevaki et al. stated that there is still very little information about asthma phenotypes in patients with COVID-19, that asthmatic patients with different phenotypes will experience COVID-19 infection with varying susceptibility and severity, and defended their hypothesis that if the virus succeeds in producing clinical symptoms in patients with allergic asthma, the risk of disease progression will be higher compared to COVID-19 patients with non-allergic asthma.[2] In addition to the fact that our patient was vaccinated, we think that eosinophilia up to 550/mm3 played a role in the mild course of the disease.

In asthma treatment, targeted biological agents such as anti-IgE and anti-IL-5 have been proven effective in reducing symptoms. Omalizumab is a humanized monoclonal antibody derived from recombinant DNA that selectively binds to human Ig E.[9] It is the first biologic therapeutic approved for the treatment of moderate-to-severe asthma that is uncontrolled despite high-dose inhaled corticosteroids and other control medications.[10] These biologics target type 2 inflammatory pathways, effectively reduce exacerbations, control asthma symptoms, and reduce systemic steroid use.[11] However, the safety profile of biologics is not yet known in the face of the COVID-19 pandemic, raising two questions for patients using biologics: Does becoming infected with COVID-19 pose an increased risk in patients using biologics, and when asthmatic patients using biologics become infected, does COVID-19 become more severe due to the use of biologics, or does biologic therapy help reduce the risk and severity of infection?[9]

Omalizumab has been shown to enhance immunity by reducing the high-affinity IgE receptor on plasmacytoid dendritic cells (pDCs), which are essential for anti-viral immunity.[12] The PROSE study confirmed this effect. In the same study, the effect of treatment with omalizumab on rhinovirus diseases in children with allergic asthma was evaluated, and it was shown to reduce the duration of rhinovirus infections, viral spread, and disease.[13] In addition to all these, there is no definitive data in the literature regarding the incidence and severity of the disease in COVID-19 patients receiving omalizumab.[9] In addition to the fact that our patient was under control with omalizumab treatment, it is seen that omalizumab did not affect the course and severity of COVID-19.

CONCLUSION

The effect of biological agents such as Omalizumab on immunity and the course of COVID-19 is not clearly known, and research is ongoing. Although our patient was expected to overcome COVID-19 mildly because he was vaccinated, Omalizumab treatment did not affect the course of the disease. This supports the view that biological agent treatment such as omalizumab is safe for COVID-19 disease.

Ethical Approval

Since our article is a case report, ethical approval was not obtained.

Peer-review

Externally and internally peer-reviewed.

Authorship Contributions

Concept: Ü.D., Ö.Ö. Design: Ö.Ö., Ü.D., Data collection or Processing: Ü.D., Ö.Ö., Analysis or interpretation: Ö.Ö., Ü.D., Literature Search: Ü.D., Ö.Ö., Writing: Ü.D., Ö.Ö.

Conflict of Interest

The authors declare that they have no conflict of interest.

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Informed Consent

Written informed consent was obtained from the patient for the publication of this case report.

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